

main source of drinking water for the people living around. In spite of being around for c. 60 years, no attempt has been made to study its faunal composition, though several endeavours have been carried out in West Bengal. Cladocerans are one of the indicators for the status of water quality. As this is the only drinking water source for this railway town, the author thought that it was necessary to identify its Cladoceran fauna.

Out of the 109 species of Cladocera reported from India, 41 species were reported from West Bengal (ZSI 1991). The present study is significant, as it is the first attempt to analyse the ecosystem of Adra lake. 13 species belonging to 8 genera from five families were identified in this study (Table 1).

Plankton was collected using a diving plankton net (No. 25), with a 50 ml plastic container tied at its end, from the sub-surface of this small water body during limnological studies in October, 1995 and February, 1996. Samples were preserved in 4% formaldehyde solution. Cladoceran fauna was identified with the aid of standard keys (Michael and Sharma 1988, Battish 1992).

During the study period, the cladocerans were dominant over the other zooplankton groups. They were mostly

abundant and diverse during winter. Out of the 13 cladoceran species, *Diaphanosoma excism* and *Macrothrix spinosa* are most dominant, followed by *Moina brachiata* and *Bosmina longirostris*. The rest were representative.

According to Das (1989), presence of *Chydorus sphaericus*, *Simocephalus* and *Bosmina* spp. (of the lake cladoceran composition) indicates an Oligotrophic lake and *Diaphanosoma* indicates a Eutrophic lake. The cladoceran parameters in this case indicate that this water body is becoming Mesotrophic and the lake water cannot be directly used as drinking water. Some filtering units are situated in the vicinity of the system for increasing the potability of water. Concerned authorities should prevent the eutrophication of this ecosystem, resulting from anthropogenic activities in the lake environs.

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S.V.A. CHANDRASEKHAR
Freshwater Biological Station,
Zoological Survey of India
1-1-300/B, Ashoknagar,
Hyderabad 500 020,
Andhra Pradesh, India.

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31. SOME OBSERVATIONS ON TWO RARE ENDEMIC DIPTEROCARPS OF SOUTHERN WESTERN GHATS

Dipterocarpus bourdilloni Brandis

Vernacular name: Malayalam: Karanjili, Charatanjali; Tamil: Karanjil

Distribution: *Dipterocarpus bourdilloni* is a rare endemic tree (one of the majestic dipterocarps), which usually occurs along riverbanks in the West Coast Tropical Evergreen forests up to 600 m altitude. Interestingly, this species shows comparatively narrow and staggered distribution and is mainly confined to the northern part of Kerala (Ramesh *et al.* 1996). We found some isolated patches near Mukkali (near Silent Valley, Palakkad district), Carcoorhat (Cannanore district) and Uppangal on the lower slopes of Coorg. It also occurs in Kallar valley, Damalayar, Pooyamkutty, Achankoil and Mandampatty in Kerala.

Floristics: Some of the associate species of *Dipterocarpus bourdilloni* are *Actinodaphne hirsuta*, *Antidesma* spp., *Artocarpus hirsuta*, *Bischofia javanica*,

Dipterocarpus indicus, *Hopea parviflora*, *Hydnocarpus* spp., *Knema attenuata*, *Macaranga peltata* and *Mesua ferrea* among others. It is a large evergreen tree attaining height up to 30-40 m and girth 4-5 m, with clear straight and cylindrical bole of 20-25 m. In lowland evergreen forests of Western Ghats, it is invariably the indicator of main strata. The classification of low elevation evergreen forests of the Western Ghats is based mainly on the distribution of *Dipterocarpus bourdilloni* and *Dipterocarpus indicus* (Pascal 1988). They are often found in mixture with other trees. Buttresses are absent although the trees are large, whether this is compensated by deep rooting is not known. Branching is generally confined to the uppermost part of the trunk and appears like a flattened umbrella. Branches are orthotropic in nature. There are no side branches up to a certain height.

Bark dark brown, thick, outer bark exfoliates in irregular flakes. Leaves up to 40 cm x 20 cm, elliptic, oblong, lateral

nerves about 15-75 pairs, petiole about 3 cm, long, stout, stipules larger, densely covered with stellate tomentum.

Though the tree is essentially evergreen, most of the leaves are shed during March. The new flush appears soon after the leaf fall. In the young seedlings, the initial leaves are usually opposite and much larger with many more ribs than the leaves of a mature tree. In the mature trees, leaves are smaller, erect, more leathery in texture and have less pronounced dry tips.

The stipules are most characteristic, sheathing the apical bud, often very long and persistent for a long period. The fall of the stipule leaves behind a conspicuous circular stipular scar. After the appearance of the new leaves, the fallen stipules are found on the ground in great numbers. Type of nervation can be used diagnostically, where the species has to be identified by the characters of fallen leaves rather than fruit. Racemes axillary, 4-5 flowered.

Dipterocarpus fruits, from which the family name is derived, have considerable taxonomic significance. Fruit bears nine to five winged ribs, having a stalk at the base, the two larger lobes are up to 10 cm x 1-2 cm. 3-nerved up to the middle usually the wing-like scales are of different length. The fruiting calyx is longitudinally ribbed. The fruit setting (April/May) is erratic and every year is not necessarily a good fruiting year.

Winged fruit is effectively dispersed only at high wind velocities, which are rare in tropical rain forests in most areas, but should be sufficient in the secluded habitat of the trees to induce proper dispersal over long distances. Sometimes winged fruits are distributed by water and the seedlings develop on riverbanks. The leaves often deteriorate very slowly and the seeds falling on the litter usually dry out and have little chance of survival.

Natural regeneration: During good seed years natural regeneration (immediately after the rain) of the species, up to the seedling stage is good. Thereafter, unless attended to, seedling mortality is high, probably due to excessive weed growth and overhead shade.

In normal position, the fruit lies length-wise on the forest floor, the growing radicle turns and grows upwards and only later turns down i.e. remains exposed to air for a long time, hence, the danger of drying out. Seedlings have one or more pairs of opposite leaves, followed by spirally arranged ones.

Fruit setting is generally very low. Seeds lose their viability rapidly, hence they germinate immediately after falling on the ground. After a resting period of several years, the seedlings grow continuously. During this period more saplings die, many become infested by pathogens or are consumed by herbivores, some do not survive in the deep

shade and others are lost through competition. The seedlings may be shade tolerant up to the bole stage. The seedlings collected from their natural habitat and transplanted in other open areas have been successful in surviving.

Economic importance: The soft wood is used in plywood industry, building construction and match industry among others.

Vateria macrocarpa B.L. Gupta

Vernacular name: Malayalam: Vellapayin

Distribution: A rare endemic species, which occurs only in a small area in Muthikulam and Attapady forests of Kerala State, as well as in the forests of Bolampatty in Tamil Nadu. It occurs mainly between 100-1,400 m.

Trees prefer rich soil having a top layer of humus with high moisture content and good drainage. In its natural habitat, the tree grows in humid climate.

Floristics: Some of the associate species of *Vateria macrocarpa* are *Aglaia* spp., *Apodytes beddomei*, *Baccaurea courtallensis*, *Cinnamomum zeylanicum*, *Cullenia exarillata* (main associate), *Elaeocarpus tuberculatus*, *Euonymus indicus*, *Glochidion* spp., *Gordonia obtusa*, *Litsaea floribunda*, *Mesua ferrea*, *Nephelium longana*, *Ostodes zeylanica*, *Pithecolobium bigeminum*, *Poeciloneuron indicum*, *Terminalia travancorensis* and *Xanthophyllum flavescens* among others.

Description: A very large elegant evergreen tree up to 40 m high and 3 m girth with clear cylindrical bole of about 15 m, without buttresses. The branches spread horizontally and form an irregular crown. No side branches can be seen till a certain height. Its bark is dull grey black, smooth with irregular white patches all over the main trunk. Bark exudes a watery sap. The old bark often peels upwards, this character often has considerable diagnostic value in field identification of the species. Leaves are up to 25 cm x 12 cm, glabrous on both surfaces, lateral nerves up to 20 pairs, parallel, prominent, leaves green yellow with age, petiole up to 6 cm long swollen at the top, minutely pubescent, stipules deciduous. Flowers in axillary panicles, white in colour. Fruits ovate narrowed towards apex, slightly curved, split apex downwards at maturity.

Fruit setting generally low, though a lot of flowers bloom. The size of the fruit also varies on the same tree. Due to their size and weight, the fruit usually falls right under the tree. With the onset of monsoon in June-July fruit ripens and start falling on the ground.

Natural regeneration: Germination starts immediately after the rain and large numbers of seedlings spring up around the mother tree and in other favourable places where seeds can reach by dispersal. Germination is epigeal. The pericarp

splits longitudinally from the apex downwards. The thick fleshy reddish cotyledons emerge out after the primary root establishes itself. The seedlings are shade lovers; hence growth can be seen in the natural undisturbed forests.

The seedlings withstand a considerable amount of shade, but are very sensitive to drought, both shade and moisture is necessary for their survival.

Sometimes the fruit exhibits viviparous tendency, if good pre-monsoon showers occur. Most dipterocarps are light demanders, except in the younger stages. Sometimes the death of a tall tree creates a small patch of light sufficient only for the most competitive species to come up. The plants have red or yellow leaves, in young stages, which may signal as a deterrent to herbivores from feeding on them, giving the plant the extra competitive edge it needs for survival.

Although many seedlings may become established in the early stages, the number which survive declines rapidly over a period of time. Many become infested with pathogens or are consumed by herbivores, some will not survive the deep shade and others will be lost through competition.

No attempts have so far been made for artificial regeneration of the species.

Uses: It is used in the plywood industry, match industry and also for construction purposes.

Discussion: In India, except for *Shorea robusta*, much attention is not being given to other dipterocarps. In view of their rarity and their extreme importance in productive forestry, these two dipterocarps should be saved from the threat of extinction. All the existing trees of the two species should be given complete protection. Seedlings can be planted in gaps in the degraded evergreen forests, both outside and within the natural habitat. Seedlings can also be distributed to the people for planting.

More detailed studies on the phenology and ecology are necessary to generate information about the species, which can be used in planning out the strategy for the conservation of the two species and their habitat.

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MANISHA THAPLIYAL¹
N. VENKATASUBRAMANIAN
Division of Biodiversity
Institute of Forest Genetics & Tree Breeding,
Coimbatore, Tamil Nadu, India.

¹Present address: Forest Tree Seed Lab.,
Silviculture division, Forest Research Institute,
Dehra Dun 248 006, Uttaranchal, India.
Email: thapliyalm@icfre.up.nic.in

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32. ON STAMEN NUMBER AND SIZE IN *BAUHINIA PURPUREA*: A REPLY TO S. BANDYOPADHYAY

Variation in the number and size of fertile stamens in the flowers of *Bauhinia purpurea* has been reported by Bandyopadhyay (2001). Having noted this variation, we have observed 68 flowers of *B. purpurea* trees occurring in the Andhra University campus. The study indicates that the flowers show variation in both number and size of stamens. Of the total flowers observed, 48 had 3 fertile stamens, 6 had 2 fertile stamens, 8 had 3 unequal stamens (2 equal in size and one almost half the other two), and 6 had 4 unequal stamens (2 equal in size and two half the length of the filaments and ¼ the size of the anthers of the other two). The filaments of fertile stamens are 51 mm long and anthers 7 mm in size. Reddi and Rao (1993) reported that even in fertile stamens, 2.7-4% of pollen grains produced in their anthers were sterile. Considering this, the pollen grains produced in the anthers of stamens with reduced length may be largely sterile. The

production of reduced and additional number of stamens in varying sizes may be a strategy developed by *B. purpurea* to enhance the probing and foraging activity of pollen collecting insects for effective pollination. Bees such as *Apis cerana indica* and *Trigona* sp. were reported to be voracious pollen collectors of *B. purpurea* by Reddi and Rao (1993). Apart from this, the variations found in *B. purpurea* are not unusual and in fact frequently found in flowering plants.

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A.J. SOLOMON RAJU
S.P. RAO
V. SREE DURGA
Department of Environmental Sciences,
Andhra University,
Visakhapatnam 530 003,
Andhra Pradesh, India.